ENGINEERING LITERATURE

M. N. Baker. Editor

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Apropos of recent discussion concerning the history of engineering and of engineers, it may be worth while to note that some companies are now using trade literature to commemorate the work of noted engineers and scientists. The Bullock Electric Co., of Cincinnati, O., has for some time issued to its patrons monthly calendar cards each of which carries the portrait and brief biography of some noted worker in the field of electricity. The firm of Wyman & Gordon, of Worcester, Mass., also issues bulletins of a similar sort, the one for the current month being devoted to a portrait and sketch of Peter Cooper. While it is true that history in such "scrappy" form is not likely to be preserved, at least on book shelves, it must not be forgotten that the object aimed at in all literature is to reach men's minds. These unpretentious little leaflets will be read by many who in these busy days would never take time to read a monumental work on biography.

The foregoing comments bring to mind some more permanent biographical records that appear from time to time, and might well become more frequent and more extended. These are: (1) The professional records of engineers proposed for membership in some of the engineering societies, and (2) memoirs of deceased members. The first of these are not published in a permanent, generally available form, and of course they soon become incomplete. Is there any practicable method of keeping them up to date? It is also to be observed that, from the nature of the case, they are the mere skeletons on which the flesh and blood of biography might be placed and the whole vitalized at some later date, but even as such they are of great value—so far as they go. As to memoirs of deceased engineers, prepared for engineering societies, they also are apt to be meager, and of a perfunctory and perhaps laudatory character. It would seem to be well worth the while of all the engineering societies to give careful consideration to the best methods that might be adopted to secure adequate and judicious biographical sketches of all deceased members. To that end, should not something be done to accumulate biographical material while it is in the making and can be secured with comparative ease?

Of the technical words in common use by engineers, few have been extended further from their original meaning, and at the same time kept in close relation to it, than "watershed." This word is often used to denote a catchment or drainage area, while its real meaning, as given by the Century Dictionary, is as follows:

Watershed: The edge of a river basin; the line separating the waters flowing into two different rivers or river basins. . . . Sometimes called the *water parting*, and in the United States more frequently and popularly the *divide*.

The "Century" quotes the following interesting discussion of the term from J. D. Whitney's "Names and Places:"

The summit of the pass is called the divide or *watershed*. In this last word the "shed" has not the present meaning, but an obsolescent one of "part" or "divide" (Ger. Scheiden), Skeat says: "The old sense 'to part' is nearly obsolete, expect in *water-shed*, the ridge which parts river-systems." . . . The *water-shed* of any river basin limits its "area of catchment," as the hydraulic engineers call it.

Now and then an engineer writes "catchment area," or "drainage area," instead of watershed. The dictionary already quoted inserts, under the main title "Area," the following:

Area of catchment: Among hydraulic engineers the area, the rainfall or drainage of which is to be made available for furnishing water at a desired point. Catchment-basin. Same as drainage-basin.

And again, we have as one of the meanings of "Basin," the following from the same authority:

Basin: In geography: (a) The area drained by a river. The term is ordinarily used only when speaking of a large river, and then includes the entire area drained by the main stream and its tributaries. The line separating two river systems from each other is the watershed.

Thus the various quotations return us to the starting point, and we see that a watershed is a line and not an area. As between catchment area and drainage area, doubtless the latter term is more commonly used in America; but in considering available sources of public water supply in such a way as to include both rainfall and area, "catchment" is particularly expressive of the exact thing in mind. "Drainage area" is likewise notably appropriate when one is considering the extent of territory drained by a stream or by a sewerage system. "Gathering ground" is also an expressive term, but is less used than any of the other previously mentioned.

Let us now pass from an old term to some new ones which seem to be misapplied with increasing frequency, namely forestry and forester. Elsewhere in this Supplement five separate publications have been noticed under the single heading "Municipal Arboriculture." The last-named word was adopted tentatively, as a substitute for the term forestry, used in some of the reports to denote the planting and care of shade trees located along roads and streets. It so happens that forest and its various derivatives are words somewhat obscure in origin, the meaning of which has been subject to marked change since a fairly well defined meaning was first accepted. But passing over the early history of the words in question we find, in the authority serving as our guide, the following:

Forest: A tract of land covered with trees; a wood, usually one of considerable extent; a tract of woodland with or without inclosed intervals of open and uncultivated ground.

Forestry: The art of forming or of cultivating forests, or of managing growing timber.

Certainly there is a great difference between selecting, planting and caring for trees grown under forest conditions and those grown for ornament and shade along country highways and city streets. In place of forestry, arboriculture and sylviculture suggest themselves. Let us see how the Century defines them:

Arboriculture: The cultivation of trees; the art of planting, training, pruning and cultivating trees and shrubs.

Sylviculture: The culture of forest trees; arboriculture; forestry.

Of these two terms the first, or Arboriculture, certainly appears to be most appropriate for the use in mind, since it omits all considerations of location, such as the forest, or purpose, like the production of lumber, and, furthermore, is broad enough to include shrubs.

It must be admitted that municipal or city forestry and forester are short and taking terms, but are they not misleading and unscientific, inasmuch as they suggest the forest and not trees along the much-frequented highway?

It is easy enough to see how forestry and forester have begun to gain a foothold in descriptions and discussions of tree culture in cities and towns. Schools of forestry and forestry work and methods are rapidly coming to the front of late, and where cities entrust the care of their street trees to trained men they naturally draw on the forestry schools.

That forestry and forester are misnomers when applied to the care of roadside and street trees planted for shade and ornament may be made still more apparent by references to "The Economics of Forestry," a recent book by Mr. B. E. Fernow, reviewed in this Supplement for Jan. 15, 1903, where forestry is defined as "the rational treatment of forests for forest purposes," and where the following interesting statement regarding what a forester is not and is may be found:

A forester, then, is not, as the American public has been prone to apply the word, one who knows the names of trees and flowers, a botanist; not even one who knows their life history, a dendrologist; nor one who, for the love of trees, proclaims the need of preserving them, a propagandist; nor one who makes a business of planting parks or orchards, an arboriculturist, fruit grower, landscape gardener, or nurseryman; nor one who cuts down trees and converts them into lumber, a woodchopper or a lumberman; nor one set to prevent forest fires or depredations in woodlands, a forest guard; nor even one who knows how to produce or reproduce wood-crops, a sylviculturist; but in the fullest sense of the term, a forester is a technically educated man, who, with the knowledge of the forest trees and their life history and of all that pertains to their growth and production, combines further knowledge which enables him to manage a forest property so as to produce certain conditions resulting in the highest attainable revenue from the soil by wood crops.

If, then, some single word is to be chosen to denote the planting and care of street trees by municipalities, arborculture would seem to be the best one available.

Practical Hygiene.

A MANUAL OF PRACTICAL HYGIENE.—By Charles Harrington, M. D., Assistant Professor of Hygiene in the Medical School of Harvard University. Second Edition, Revised and Enlarged. Philadelphia: Lea Brothers & Co. Cloth; 6 × 9 ins.; pp. 760; 12 plates and 113 figures in the text. $4.25 net.

This book deserves a high rank among general treatises on hygiene. It is comprehensive in scope and, considering its aim, the various branches of the subject are adequately treated.

The author has shown unusually good judgment in selecting his material from a wide range of

sources and drawing his conclusions therefrom. If one can judge from such sections as those on water, sewage disposal, house plumbing, and ventilation, seldom is the author caught in the pitfalls which beset all but specialists in the various branches under consideration, and this is saying much for such an extensive work.

Before giving a general outline of the book it may be said that the second or present edition (published late in 1902) was demanded in a little more than a year after the appearance of the first, and that in the later edition about 70 pages of new matter appears and some 30 pages is omitted. The new matter includes a chapter on the relation of insects to human disease, besides various lesser additions.

Considerably more than a fourth of the volume is devoted to foods, including both solids and liquids, and, of the latter those that stimulate as well as those that nourish. In each case, the nature of the food, its inspection and analysis, dangers attending its production, preservation, or sale are presented. The dangers due to possible poisoning and the spread of communicable diseases are also set forth. There is a section on food preservation, and another one on the contamination of foods by metals.

Next come fairly long chapters on air and soil, respectively, and then some minor adverse comments on the first of these three chapters may be made. The author appears to have overlooked the recent bacterial studies of street dust; in fact, neither pavements, roads, or streets are given in the index.

The few words of description of a specific smoke-preventing device seem hardly called for. Sewer ventilating shafts have been but little used in this country, but are still used quite extensively in Great Britain.

Under "Habitations, Schools," etc., ventilation and heating, lighting, and plumbing are taken up in succession. Sewage disposal has twenty pages, and garbage disposal four. Under the latter there appears to be a little confusion. The heat from combustible refuse, and not from garbage, has been used on a small scale to produce power in Boston and New York, but in neither case has the power production been put on anything like a commercial basis. A fair idea of the present number and magnitude of garbage reduction plants is not presented.

Among the subsequent topics may be mentioned disinfectants and disinfection, military, naval and marine, tropical, and personal hygiene; hygiene of occupation, vital statistics, quarantine, and disposal of the dead.

The illustrations are not numerous, but have been chosen and presented with care. There is a serviceable index. Finally, the author might properly have laid claim, in his sub-title, to more readers and users than "students, physicians, and medical officers," but it is primarily designed for and eminently suited to the classes named.

High-Speed Steam Engine Design.

DESIGN OF A HIGH-SPEED STEAM ENGINE.—Notes, Diagrams, Formulas and Tables. By J. F. Klein, Professor of Mechanical Engineering in Lehigh University. Second Edition, Revised and Enlarged. New York: D. Van Nostrand Co. Cloth; 6 x 9 ins.; pp. 257; 140 illustrations, including some figures on folding plates. $5 net.

This book is devoted to the solution of the problem of determining the principal dimensions of a non-condensing high-speed steam engine of 110 HP., to carry loads varying from 50 to 170 I. H. P., and with a total variation of less than 2% from the normal. Whether this variation is the momentary variation for instantaneous change of load or the final rate of speed is not stated. Throughout the book the author adheres to the mathematical form of expression. For instance, he says that:

> For the best practice, with large engines, dry steam, high piston speed and good design, construction and management the consumption of steam should be not more than
>
> $$\frac{150}{\sqrt{p_1}}$$
>
> in which p_1 is the absolute pressure in pounds per square inch.

It would have been exactly as easy and shorter on the whole to have said the same thing in words or to have at least omitted the symbol entirely and printed the term "absolute steam pressure" as the denominator of the fraction; but it seems to be born in a large proportion of writers of engineering text books to prefer mathematical language wherever it is possible to use it. They have so familiarized themselves with "p_1" that it means something to them at a glance, whereas the practical man has to find out what the symbols signify before a formula expresses to him any meaning at all.

Similarly when our author wants to say that the clearance volume is usually expressed as a percentage of the volume swept through by the piston he does it by saying:

> If l represents the clearance, A the area of piston and S the stroke, we have
>
> $$l = \frac{\text{clearance volume}}{A\ S}$$

We can almost forgive him for this, however, since he did not use a Greek letter to represent clearance volume as he might have done!

We cite these instances merely to illustrate the fact that the author chooses the mathematical form for his discussion, although he intends his work, we believe, to be of direct service to engine designers. Doubtless it will find a place in many engine works, although its chief sale, we imagine, will be to the engineering schols for use as a text book; and the purely "practical" engine-builder will find very little in it of which he can make use.

Returning to the contents of the book, it may be said that the author describes in detail the operations to be carried out for determining the clearance, cut-off, length of connecting rod, size of cylinder, speed, weight of reciprocating parts and of fly-wheel rim, balancing of rotary and of reciprocating parts, crank-shaft journals, steam passages, etc., etc. Finally he reaches the subject of valve-gear and to this the last half of the book is devoted. Many of the principal types of high-speed valve gears are described and analyzed.

To the present edition four appendices have been added, discussing various special problems in connection with the design of engines, chiefly with relation to valve-gearing and the inertia forces acting upon the moving parts.

The most serious criticism we can make upon the book is that it is wholly without either table of contents or index, or any means by which reference may be at once made to a particular subject in it. This rather confirms our opinion that it is chiefly intended for use as a text book since the boy in school is apt to be interested only in the particular pages on which his lesson lies. But in any book for use by busy engineers, to whom time is money, the omission of any means by which a book can be used for reference without hunting through its pages from cover to cover is a most serious fault.

A Book for Owners and Users of Refrigerating Plants.

MECHANICAL REFRIGERATION.—A Practical Introduction to the Study of Cold Storage, Ice-Making, and Other Purposes to Which Refrigeration is Being Applied. By Hal Williams, Assoc. M. Inst. Mech. E. London: Whittaker & Co. New York: The Macmillan Co. Cloth; 5 x 8 ins.; pp. 406; 115 illustrations, including some on folding plates. $2.25 net.

The purpose of the author of this book has been to depart somewhat from the practice of previous writers and to consider his subject from the stand-point of the owner and user of refrigerating machinery. Accordingly, we find less attention than usual given to descriptions of refrigerating machines and processes and greater attention than usual devoted to the properties of refrigerants, arrangement of plant, insulation, auxiliary steam plant, cold store construction and special applications of refrigeration. There is much to be said in favor of this scheme of treatment. A refrigerating plant in its practical application is something more than a selection of efficient refrigerating machinery. It is a carefully thought out construction of machinery and buildings for the manufacture and application of cold to certain purposes, such, for instance, as the making of ice. Being such a manufacturing plant all the considerations which effect the efficiency and economy of manufacturing plants for other purposes apply to the construction, arrangement and operation of a cold store or ice plant. This is the fact that the author endeavors to keep first in mind in his book.

The book opens with a concise introduction explaining the general principles of mechanical refrigeration. With the reader established on an understanding basis with respect to these general principles, the author discusses and explains the laws of heat, fluids, liquids, gases and vapors, and thermo-dynamics and entropy, in two chapters of about 60 pages. The next three chapters explain and describe refrigerating processes and machines. In this discussion the author devotes his attention chiefly to the compression process and to those compression systems which utilize ammonia and carbonic anhydride. This selection the author says is not due to any failure to appreciate the merits of cold air, sulphuric dioxide and ammonia absorption machines, but to the necessity imposed on him by the available space of concentrating his attention on what he considers to be the most important subjects. These chapters bring the author to what may be called the practical sections of his book.

The first chapter of this section, or Chap. VI. of the book, relates to what the author terms the refrigerating plant. This includes compressors, condensers, driers and their piping, valves and connections. A chapter on auxiliary plant follows. This includes information relating to engines, boilers and boiler settings and fittings, condensers, cooling towers, pumps and all other apparatus for steam power plant. An excellent chapter on insulation, another on brine and a third on distilled water plants then follow. Ice-making and cold storage are each given a separate chapter as being the most important applications of artificial refrigeration. These chapters are comprehensive and complete. A chapter is devoted to data and suggestions respecting the cold storage of various articles such as eggs, meat, fish, butter, vegetables and fruits of different sorts. The concluding chapter describes the application of refrigeration to brewing, chocolate making, dairy work and other special purposes.

A Text-Book on Transformers.

THE ALTERNATING-CURRENT TRANSFORMER.—By F. G. Baum. New York: McGraw Publishing Co. Cloth; 6 x 8 ins.; pp. 195; 122 illustrations in the text. $1.50.

Being based on a course of lectures to students in electrical engineering, this book is primarily a text-book. The treatment of the subject has that degree of mathematical conciseness usually found in text-books. That is to say, when a phenomenon or relation is expressed by an equation, this latter is reduced to other terms and evaluated purely by writing its successive forms as a series of equations, connected at best with phrases like "from which we get," or, "since A = m, and Bg = d, this becomes." This feature makes a book that treats of a subject necessarily involving mathematical expression, as is the case with the study of transformers, hard reading for others than students. On the other hand, since it forces a close examination of the mathematical development to discover the steps of reasoning involved there is a value in that conciseness.

As to the subject itself: The transformer is a highly interesting object in the field of electrical working because it is the concrete reason for the use of alternating current. Moreover, in a theoretical way it occupies a prominent place because the graphical methods which have found such wide application in alternating current investigations have developed from the diagrammatic representation of transformer conditions. It may be guessed that the literature of transformers is not at all scanty. However, there is always a place for a work in which a subject is treated simply and with reference to current practice, and where the principal facts of accumulated experience with that subject are properly brought together. The present book seems to be of this kind, and while it is best suited for class-room use, it should also prove valuable as a reference book to the electrical engineer. A particular reason for this is the fact that the commercial art of designing transformers is not a matter of public record, and that the field of applied electricity is to-day such a broad one that only few of those engaged in it

can follow in detail all its theoretical and practical developments.

The book begins with a short statement of what is involved in electro-magnetic induction and defines self-induction and mutual induction. The investigation of the action of the transformer is given in Chapters III. to V.; all the phenomena are referred to the resultant magneto-motive force and its corresponding flux. Hysteresis is at first neglected, but it is considered later, and its distortion effect shown. After the general phase relations of the E. M. F.'s and currents are discussed, the quantitative calculations are separately taken up under the headings "Regulation" and "Efficiency." This latter (the efficiency) is especially important because, unlike other electrical machinery, transformers consume power whether they deliver power or not, since their primary circuits are usually kept on the supply network for the full 24 hours; the "core" loss, or power loss when the transformer is unloaded, should therefore be as small as possible. The "aging" of transformer cores, or increase in losses due to the long-continued low heating produced by their operation, is discussed in this connection.

The cost-efficiency of transformers is next in importance to the energy-efficiency; the first cost, and the losses or operating cost also, decrease materially as the size of the transformer increases. Now, by adopting different systems of house-distribution, either many individual house-transformers or fewer group-transformers may be employed, and the latter is shown to be usually more economical and the preferred practice to-day.

Station managers should test the transformers they buy, in order to make sure that the voltage regulation and the losses are within economical limits. In the early days of transformers, when testing was rarely done, the current lost in the transformers often constituted a great but unsuspected drain on the station-output. Simple methods for carrying out the principal tests are described in the book under review. After this the matter of designing transformers is taken up, separately for the two types generally current, the core type and the shell type. The formulas developed contain certain constants, representing the dimensions of the core, the proportion of copper to the winding-space, etc., and the approximate range of values for these constants in commercial transformers is given, for the guidance of the student.

Auto-transformers, induction coils, circuit-regulating transformers, constant-current transformers (producing a constant-current supply from constant-voltage circuits), series transformers, etc., are briefly considered, but without analytical study. The various ways in which transformers may be connected into single or multiphase circuits are discussed in a separate chapter. The concluding 40 pages show views of transformers made by different manufacturers, mention being made of the leading features of each make. A few pages appended to the book give the Underwriters' provisions concerning the construction and installation of transformers.

THE PROFESSOR ON SHIPBOARD.—A Story of a Voyage of a College Professor with His Brother, Who Was a Chief Engineer of a Steamship. By C. A. McAllister, Chief Engineer, U. S. Revenue Cutter Service. New York: Marine Engineering. Cloth; 5 × 7 ins.; pp. 103; figures in the text. $1.

Some people have to take information in sugar-coated form. This book is an attempt, and a successful one, to sugar-coat a lot of very good information concerning the practical operation of marine engines and boilers. As the author says in his preface he has tried to give story enough to hold the interest of the reader, while devoting the main part of the space to a discussion of practice in the design and operation of marine machinery. The chief feature of the book is the contrast drawn between the work of the machine designer and of the machine user. The fact is repeatedly brought out that the designer would be able to do much better work, if he were practically familiar with the condition under which his device is to be used. Thus, when the ship is rolling, one stoker has to hold the furnace door open while another shovels in coal, whereas it would be perfectly easy to have a catch to the door latch which would hold it open till the stoking was done. On the other hand, the book also brings out numerous instances in which waste and inefficiency occur because the men in charge are not informed as to the best methods of working. This contrast of theory and practice is set forth throughout the book in a very entertaining way. It may be added that the book was first printed as a series of articles in "Marine Engineering" and brought forth so many letters of inquiry and appreciation that it was decided to issue it in book form.

THE PRACTICAL GAS ENGINEER.—By E. W. Longanecker, M.D. Third edition. Published by the Author. Cloth; 4 × 6½ ins.; pp. 143. $1.00.

This little book aims to be of service to those who wish to know how to select a gas or gasoline engine, or how to handle one, without possessing any closer knowledge of the gas engine as a machine. In 471 short paragraphs, covering 127 pages, there is a full description of gas engines and their essential parts; what points should be observed by the purchaser in selecting a gas engine; how to construct a foundation; how to start the engine and take care of it generally; and, more important even than this, what defects to "suspicion" when the thing won't start.

The book is so extremely non-technical and "popular" or elementary that it can hardly be considered valuable reading for the engineer. Its arrangement, moreover, is such as to impede quick reference to any particular matter. To overcome this difficulty, however, a full index, covering 15 pages, is added; while most of this index is merely satisfactory, some of the entries are truly original, as the following examples will indicate:

All senses used for detecting irregularities.
How to stop a gas engine.
Illustration of engine connections.
Keep clean.
Turn! Turn! Turn! and no start.

There are more like these.

An attractive feature of the book is its unconventionality of language; the author evidently aimed at a vigorous, terse and graphic style. Consider the force of the following passage:

If neither of the first three or four charges are ignited the cause of non-ignition will not be removed by turning the wheel, and will probably be getting worse the longer you turn, and the fellow who does not know what else to do but turn, ought to be compelled to turn vigorously until his tongue hangs out of his mouth to the length of a full-grown lead pencil. If such exertion doesn't start his thinker, his case is probably hopeless.

The title-page credits the author with the distinguishing letters M. D., and this may serve to explain the anatomical allusion.

The reminders and suggestions made in the book are all of them good and they may prove helpful in many cases where an amateur or a self-made "gas engineer" gets into trouble with his engine. The fact that the book has run into its third edition (according to the title-page) seems to indicate that the public has appreciated its worth.

GAS ENGINES AND THEIR TROUBLES.—By E. W. Roberts. With Additional Chapters on Design, Construction, Powering and Propulsion of Launches. By Prof. W. F. Durand. New York: Marine Engineering. Cloth; 6 × 8 ins.; pp. 143; illustrated. $1.50.

The first half of this book deals with gas engines, or rather gasoline engines, of the sizes and types suited for use in boats. A good, yet concise, description of the essential parts of the engine is supplemented by a somewhat fuller description of the vaporizing apparatus and the mechanism and acessories of the igniter. How to install an engine in a boat; how to operate it; common troubles occurring with gasoline engines and the remedies therefor, and the simpler kinds of repairs, are treated in separate chapters. The experience of the author with these matters has enabled him to make his advice and instructions succinct and practical. Two chapters which depart somewhat from the direct field of the book as is indicated by the title, but which are worth the space given to them, are "Preparing for a Cruise" and "How to Handle Gasoline." The latter chapter shows by photographs of actual experiments that many dangerous looking things may be done to gasoline with impunity. The author holds a lighted cigar over a gasoline can, lights the vapor at the mouth of the can with a match, smokes a cigar soaked in gasoline, and is still alive. In fact, referring to the latter experiment the author says that "he is quite accustomed to the taste of gasoline, and, with the exception of a possible slight tendency to light-headedness, suffered no inconvenience whatever." It is not likely that many of his readers will repeat that particular experiment, and if the chapter leads them to carelessness about bringing lights into the neighborhood of a gasoline can we think they might fairly be charged with a "tendency to light-headedness." However, the purpose of the chapter, which aims to show that gasoline is much less dangerous than is commonly supposed, is entirely laudable.

The second part of the book, written by Prof. W. F. Durand, is of interest mainly to the amateur who wishes to build a gasoline launch. The design of the launch body, and its actual construction, are treated in two quite extended chapters. The "powering" of a boat, and the design of the propeller, are treated more briefly in the concluding chapter. The entire book is a reprint of articles which appeared in "Marine Engineering."

Municipal Arboriculture.

TREE PLANTING ON STREETS AND HIGHWAYS.—By William F. Fox, Superintendent New York State Forests. Albany, N. Y.: Forest, Fish and Game Commission. Paper; 8 × 11 ins.; pp. 50; colored and other plates.

THE PROTECTION OF SHADE TREES IN TOWNS AND CITIES.—Bulletin 131, Connecticut Agricultural Experiment Station. New Haven, Conn.: As above. Paper; 6 × 9 ins.; pp. 30; 9 plates.

SHADE TREE SUGGESTIONS.—By Aven Nelson. Bulletin No. 51, Wyoming Experiment Station. Laramie, Wyo.: As above. Paper; 6 × 8 ins.; pp. —; 5 plates.

THE SHADE-TREE QUESTION.—By a Special Committee of the Hartford Florist Club, Hartford, Conn. Included in the August Bulletin of the Connecticut Society of Civil Engineers. New Haven, Conn.: The Society. Paper: 6 × 9 ins.; pp. 13.

STREET FORESTRY.—Report on the Selection, Planting, Cultivation and Care of Street Shade Trees. By Frederic Shonnard, Forester. Yonkers, N. Y.: S. L. Cooper, Commissioner of Public Works. Paper; 6 × 8 ins.; pp. 48; tables and many plates.

It is gratifying to note the almost simultaneous appearance of so many reports on the planting and care of trees for country roadsides and city streets.*

Mr. Fox's handsome report is notable on account of its plea for roadside planting, its scholarly presentation of the whole subject under discussion, its abstract of State legislation relating to trees in highways and streets, and its illustrations. Among the latter are some well-rendered colored reproductions of autumnal and other foliage.

The Connecticut State bulletin was the work of a large committee of citizens of New Haven, which included Prof. W. H. Brewer of Yale University, Prof. Henry S. Graves, Director of the Yale Forest School, and Dr. E. H. Jenkins and W. E. Britton of the Experiment Station. This bulletin is primarily a study of the conditions existing three years ago in New Haven, but it is in its main features applicable to other communities. In fact, its plan is followed, in some respects, by two or three of the other reports. The bulletin opens with a review of the causes and remedies for the generally unsatisfactory condition of the shade trees of New Haven. Old age, lack of air and water about the roots, lack of plant food, mutilations by horses, linemen and other agencies, poisoning by illuminating gas, insect injuries, and lack of knowledge and care in planting, are among the subjects discussed. A so-called city forester and a city nursery are recommended. There is a brief review of trees suitable for planting in New Haven. The illustrations are well chosen.

The Hartford committee consisted of five citizens, three of whom, including Mr. Theo. Wirth, Chairman, are members of the Connecticut Society of Civil Engineers. The report discusses trees in their relation to streets in general, and then in relation to Hartford in particular. Like the New Haven committee, this one concludes that the street trees of its city are in bad condi-

*With the exception of the Connecticut Experiment Station Bulletin all these reports have been issued during the current year.

tion, are not well cared for, and should be put in charge of a so-called city forestry department.

In his Wyoming report Mr. Nelson calls attention to the peculiar conditions in Wyoming, which make tree culture unusually difficult and desirable. A number of practical suggestions for the selection, planting, pruning and irrigation of trees are given, and there is a section on insects.

The Yonkers report is the only one in the group made by a municipal official, as such. The city, it will be seen, already has an official named a forester, and his report shows that careful attention has been given to the individual trees of the city. A table is given showing by streets the work already done. Of a total of 5,265 trees examined there were 1,048, or 20%, that showed various injuries. Operations on 4,711 trees are recorded, and most of these were trimmed and had the wounds painted a second time. Unplanted sidewalks aggregate 215,717 ft., or some twenty miles of streets. On the other hand, many streets are badly overcrowded with trees. The report includes quite an extensive review of the services of street trees, opportunities for improvement in Yonkers, the best varieties for planting, the care of trees, and their protection from gas, electricity, and insects. The author presents a table of ratings of 17 large and 19 medium-sized varieties of shade trees, compiled from the writings of Mr. B. E. Fernow, Dr. L. O. Howard, and Dr. Ephraim Felt. The table gives the common and scientific names of each tree and its range in height; ratings as to general value, immunity from insect attacks, and relative amount of water needed.

It may be noted in conclusion that the terms forester and forestry are being introduced in this new branch of technical literature, and that they are being applied not to forests, but to shade and ornamental trees along country roads and city streets. Comments on such a use of forester and forestry may be found on the editorial page of this Supplement.

Additions to Forestry Literature.

REPORT OF THE BUREAU OF FORESTRY IN THE PHILIPPINE ISLANDS, FROM JULY 1, 1901, TO SEPT. 1, 1902. From the Report of the Philippine Commission, Bureau of Insular Affairs, War Department. Washington, D. C.: Pub. Doc.; paper; 6×9 ins.; pp. 452-527; illustrated.

This report covers the work of the timber-testing laboratory and workshop, at Manila. About 40 stations have already been established in the islands for studying the botany and growing timber and plants of this region, and licenses are being issued to individuals to cut timber on public lands. But the average cutting under a single license, in one year, is less than 6,000 cu. ft. The individual pays the government from 1 to 14 cts. per cu. ft., in Mexican money, according to the grade of timber. But native timber is still high priced and scarce, and some millions of feet of lumber are imported from the United States by several of the government departments. Oregon pine, which costs $9 per 1,000 ft. in gold at Portland, Ore., costs $21.65 to $26.50, gold, at Manila, and redwood costs $31.50 at the same place. The forest area of the Philippine Islands is estimated at 48,112,920 acres, including about 1,000,000 acres of private woodlands. Between 600 and 700 varieties of trees are already known to some extent; but a preliminary examination shows that these forests have been almost entirely destroyed in some places, on a line following that of civilization. In Celen, Panay and Negros islands very little merchantable timber of a high grade can be found. But there are still about 20,000,000 acres of virgin forests in Luzon and other islands. Many fine woods suitable for furniture are found, and there are large areas covered by gutta percha and a good quality of rubber. The islands are also rich in other gums and in valuable dye-woods. No estimate can yet be made of the values of these forests; but the report states that a safe estimate of volume is about 3,500 cu. ft. for each of the 20,000,000 acres referred to; at 6 cts. per cu. ft. the value to the Philippine government is over $100 per acre. The remaining 28,000,000 acres of less valuable timber should be worth not less than half of this sum. The chief markets considered in the reports are the home market and the Chinese market, which is always strong. The report enters into the details of the investigations already made and is illustrated by a large number of photographic views of timber and timber cutting in the Philippine Islands.

PAPERS ON FORESTRY.—Washington, D. C.: Bureau of Forestry, Department of Agriculture. Four pamphlets. Paper; 6×9 ins.; illustrated.

A 12-page pamphlet by W. L. Hall discusses the important question of "Practicability of Forest Planting in the United States," and shows that it is practicable in a large part of the country. The work of the Metropolitan Water and Sewerage Board of Massachusetts and the water department of Woonsocket, R. I., in planting trees on watersheds supplying reservoirs is referred to. A four-page pamphlet by Overton W. Price deals with the "Influence of Forestry Upon the Lumber Industry." A 6-page pamphlet by F. E. Olmstead describes "Tests on the Physical Properties of Timber," and outlines tests conducted in Europe and in this country, with the proposed tests of the Department of Agriculture. The fourth is a 14-page pamphlet containing three addresses by President Roosevelt, R. L. McCormick and Gifford Pinchot.

A PRIMER OF FORESTRY.—By Gifford Pinchot, Forester. Farmer's Bulletin No. 173. Washington: U. S. Department of Agriculture. Paper; 6 × 9 ins.; pp. 47; 33 illustrations in the text.

This is a republication, in cheaper form, of Bulletin No. 24, Division of Forestry, which had the same title and ran through two editions of a total of 45,000 copies. The author discusses, in language easily understood, the life of a tree, trees in a forest, the life of a forest, and the enemies in a forest, including, under the latter, fire, wind, snow, fungi, insects, and grazing animals. The present notable widespread interest in forestry seems likely to bring the circulation of this useful Primer up to 100,000 copies. It may be obtained by any one for the asking.

A Translation an dAdaptation of a German Work on General Climatology.

HAND-BOOK OF CLIMATOLOGY.—By Dr. Julius Hann, Professor of Cosmical Physics in the University of Vienna, and Editor of the "Meteorologische Zeitschrift." Translated by Robert De Courcy Ward, Assistant Professor of Climatology in Harvard University. New York: The Macmillan Co. Cloth; 6×9 ins.; pp. 437; diagrams. $3 net.

As this translation essentially reproduces the original text, most of the examples given necessarily relate to Europe; though some new examples of different climatic phenomena, taken chiefly from the United States, have been added by the translator. The publication of the work in English is intended to lead to broader lines and further system in the study of scientific climatology in this country, this being a subject upon which there is comparatively little well-arranged and accessible literature.

There is a considerable difference between climate and what is termed weather. The latter is only one phase in a succession of phenomena, while climate is the sum total of the weather as usually experienced during a longer or shorter period of time at any given season. The chief climatic elements, or factors, are temperature, humidity, rain or snow, velocity and direction of the wind; and the purpose of scientific climatology is to find numerical expressions for all these climatic elements. Temperature is the most important climatic element; and the author first treats of the methods and times of observing the temperature of the air, of the mean monthly range, irregularities and other important temperature data. Next to temperature we must study the measure of humidity, or the quantity of water vapor in the air and the amount and kind of precipitation. Temperature and rainfall determine the productiveness of a country; and to illustrate the author contrasts the grazing districts of Australia and Argentina. In New South Wales, with 13 to 20 ins. of rainfall, it is estimated that one square mile of territory will feed from 96 to 640 sheep; while in Buenos Ayres, with 34 ins. of rainfall, the same area will feed 2,630 sheep. In fact, in Australia, land with less than 10 ins. of rainfall is practically valueless. In similar calculations made for Jamaica, it was found that 56 ins. of rainfall gave 1,441 casks of sugar per acre; while 76 ins. gave 1,559 casks for the same area, or an increase of $500,000 in the annual value of the sugar crop of that island.

The movement of the air increases evaporation, dries the soil, and increases the need of organisms for water, and the velocity of this movement must be taken into account, as well as the effect of the wind upon the temperature. As a rule, climates with a considerable air movement have a stimulating effect upon man, which is conducive to active work; while the stagnation of the air, as in enclosed valleys in the tropics, is conducive to inactivity, and is the cause of much unhealthiness.

The foregoing notes will serve to show something of the general scope of the book and the method of treatment employed. A brief outline of the contents may next be given. Part I. deals with "The Climatic Factors," already named in the second paragraph of this notice. Part II. is entitled "General Climatology: Solar Climate and the Chief Varieties of Physical Climate." This subject is further divided into three sections, of which Solar climate requires only one chapter, physical climate, 15 chapters; and changes of climate, two chapters. Continents, ocean currents, forests, position in relation to the equator, mountains and valleys, are each considered in their relations to some or all of the climatic factors. There is a chapter on "Snow-Line and Glaciers; Climatic Zones on Mountains," and another on "The Foehn, Sirrocco, Bora and Mistral." The changes of climate are considered at some length from the geological viewpoint, and various theories of the causes of geological changes are reviewed. The chapter on "Periodic Changes of Climate" is particularly interesting.

The original German work appeared in 1883, in the "Bibliothek Geographischer Handbücher," edited by Prof. F. Ratzel. A second edition of the former, in three volumes, was published in 1897, and the translation and adaptation here noticed is based on the first volume of the second edition. The other two volumes, the translator states, deal with special climatology, and it has been found impracticable to translate them.

The Sanitation of Zurich.

DIE ASSANIERUNG VON ZURICH.—Edited by T. Weyl. Leipzig: Wilhelm Engelmann. Paper; 7 × 10½ ins; pp. 120; 40 illustrations in text; 10 plates. $3.

This volume is the third of a series dealing with the Sanitation of Cities. Those on Paris and Vienna have already been issued. The term "sanitation" is used here in its broadest sense, to include not only sewerage and waste disposal, but also water supply, regulation of food supply, care of streets, disposal of dead, etc. Zurich is particularly interesting as regards its sanitation because it was very slow to get rid of the mediæval conditions encumbering it. In fact, its entire sanitary activity dates back only about 35 years; since then, says the editor in his preface:

> the city has been provided with a plentiful supply of good water and with a satisfactory drainage system. Large sums have been expended for city extension and for opening new, wide streets. The administration of public health and sanitation is excellent.

The water supply of the city is complicated by the fact that Zurich, which lies on the border of Zurich Lake, extends up on the hill sides to many hundred feet above the lake level. The development of a general pumpage system, begun only in the 70's of the last century, was much retarded by this fact. At present the system comprises four pressure-zones. Part of the supply is from distant springs, the remainder from the lake. The latter supply is now doubly filtered; a serious typhoid epidemic in 1884 showed the danger of using the local water without filtration.

Until after 1860 the common practice in Zurich was to leave a narrow alleyway, a few feet wide, through the middle of the block, and to build privies overhanging the alley. The floor of these alleys was covered with straw, and when enough matter had accumulated over the straw to make it worth while, the alley would be cleaned out and the contents hauled away by farmers. In some cases, where a square of houses enclosed a court, a cesspool built in this court served in common for the inhabitants of all the surrounding houses. Storm water was carried off by a partial system

of box-drains in the streets; and by open gutters, which latter also served to carry off the liquid drainage from the alleys above mentioned. About 1860 a system of sewers was begun, which has since then been in constant process of extension. This sewerage system comprises a set of storm-water sewers, and separate conduits for ordinary surface drainage, house waste-water, and also the liquid portion of human wastes. The can or pail system has been substituted for privies and cesspools, but in recent times water closets are on the increase. The sewerage system discharges into the Limmat, the outflow of Zurich Lake. The cans or pails used in the privy system are developed from those used in Paris; they are constructed so as to effect a partial separation of solids and liquids, the latter flowing to the sewers. The emptying and washing of the cans is done by the city in a special establishment; the contents are sold or given to farmers or used on the city farm lands. Garbage, ashes, etc., are collected and carted away by the city; a destructor system is now being built. Dead animals, refuse from slaughter houses and similar places are taken care of by a reduction plant. Cemeteries are owned by the city, with one or two exceptions; a public crematory also exists, but in spite of the service being free for citizens, only 160 bodies were cremated in 1902, the 14th year of existence of the establishment.

The book treats all these subjects in detail, historically and constructively; statistical figures are frequently cited to give some idea of the conditions and results.

A Treatise on Statics of Structures and Mechanics of Materials.

STATIK DER BAUKONSTRUKTIONEN UND FESTIGKEITSLEHRE, VORLESUNGEN UBER.—By G. C. Mehrtens, Professor of Engineering at the Royal Technical College at Dresden (Saxony). Vol. I: Fundamental Considerations. (Vols. II and III to be issued in 1904 and 1905 resp.) Leipzig: Wilhelm Engelmann. Paper, 6½ × 9½ ins.; pp. 423; 377 illustrations in the text. M. 20 = $6.

This first volume of Professor Mehrten's work on Statics of Structures is to be followed by two complementary volumes, the one to be issued in 1904, the last in 1905. The complete work is intended to cover the entire field of the stress-investigation of engineering structures, statical investigation in the main, but in the last volume also touching on dynamic actions and vibrations.

A very thorough and detailed treatment is the prime characteristic of the work, if we may judge from the volume before us. The first volume is intended to give the fundamental, general matter; the second and third volumes will deal respectively with the calculation of stresses in solid structures and frameworks, and the calculation of special types of structures, secondary stresses, and dynamic stresses. To give an idea of the work we can do no better than to follow the author's own analysis of the first volume, as given in his preface:

The first volume is subdivided into four parts. Part I., covering 84 pp., treats in an introductory way of the nature of engineering structures and their essential parts. Materials and their properties are reviewed; the subdivision of structures into support and body is described; an analysis of methods of support is presented; the manner of composition of articulated frames with regard to their rigidity is discussed; and lastly a brief synopsis of the historical development of structures and of the growth of their theory is given.

Part II., comprising 80 pp., constitutes a treatise on statics of force-systems. The graphical treatment is given the first importance.

Part III. describes the methods of finding the stresses in frames, both plane and spacial. The case of frames which cannot be analyzed by ordinary methods except through the solution of a series of simultaneous equations is given special consideration; the process of stress-determination by elimination and substitution of bars to form a simpler frame is fully discussed. The kinematic method of analysis is also treated. The entire part covers 103 pp.

Part IV., in 140 pp., treats of stresses in prismatic bodies, or straight bars. The graphical treatment of surface-moments is first given; the various simple stresses are discussed, including flexure as a distinct kind of stress; shearing and principal stresses are analyzed; and finally the determination of stresses in materials of varying modulus and in composite bodies (concrete-steel) is discussed.

The entire work represents a course of lectures given by the author at the Dresden Technical College. In fullness of theoretical discussion it far surpasses not only any engineering course offered in American technical schools, but also any treatise or text-book on statics and mechanics of materials in the English language. We may express the hope that an English edition of the work will follow its appearance in German, to make it available as a reference treatise on the subject for American engineers. It is hardly likely that it will find use as a text-book in this country, even in modified form.

A feature that deserves special notice is the use of two and three color printing for truss diagrams, force polygons, and similar drawings. A set of lines in such a drawing that it is desired to emphasize or separate from the remainder is drawn in red, and where two such sets of lines occur red and green are used. These multi-color diagrams are extremely effective and clear, and it is gratifying to see that the publisher did not balk at the extra expense involved. It may be said, also, that the arrangement and printing throughout are extremely simple and utilitarian, and on that account pleasing in effect. This feature, with the abundant cross-references in the text, and the subject-index and full bibliography which are promised to form part of the third volume, distinctly enhance the practical value of the work.

THE DRAFTING OF CAMS.—By Louis Roullion. No. 2 of a Series of Practical Papers. New York: The Derry-Collard Co. Paper; 5½ × 8 ins.; pp. 23; 16 illustrations. 25 cts.

The process of laying out a cam to produce any desired motion is reduced to its simplest terms in this short essay. The subject is introduced with a definition which if not comprehensive is at least sufficient as a basis for further discussion:

A cam is a device for converting circular into reciprocating motion. It generally consists of a disc having an irregular face that acts as driver to a follower in contact with it, or else of a groove cut in a flat or curved surface.

The principle of the work of drafting a cam is explained first by the example of the most simple cam arrangement: A cam having uniform rotation used to produce uniform reciprocating motion by a pointed follower moving on a diameter of the cam. The modifications introduced by using a roller follower, non-central follower, a pivoted follower or a follower constrained to a given irregular path, are successively explained by separate examples. Cylindrical and conical cams are then referred to, and finally a cam oscillating about a center (belt shifting device for a planer) is worked out as a still more complex example. The simplicity and clearness, as well as the compactness of the treatment, especially commend the pamphlet.

HOW TO MEASURE UP WOODWORK FOR BUILDINGS. —By Owen Maginnis. New York: Industrial Publication Co. Cloth; 5 × 7 ins.; pp. 79; tables and 161 illustrations in the text. 50 cts.

The author takes up, in succession, window frames and sash, door jams, base and trim, wainscoting, doors, and so on through the various details of buildings. There is a separate chapter on figuring rough timber for frame buildings. Numerous detail drawings add to the clearness of the book.

DUNCAN'S MANUAL OF TRAMWAYS, Omnibusses and Electric Railways of the United Kingdom and the Foreign and Colonial Companies that are Registered in England. London: T. J. Whiting & Sons. Cloth; 5 × 7 ins.; pp. 564. $2.

The 26th edition of this work follows the lines of previous issues. It gives lists of officials, capital and revenue accounts, rolling stock, mileage run, passengers carried and receipts and expenses per mile for the various roads and companies. Both private and municipal undertakings are included.

Extracts from the Tramways Act are given, and there is an alphabetically arranged directory of tramway officials, including engineers.

A Directory for the American Shipping Industries.

BLUE BOOK OF AMERICAN SHIPPING. Marine and Naval Directory of the United States, 1903.—Cleveland, O.: The Marine Review Publishing Co. Cloth; 7½ × 10½ ins.; pp. 468; illustrated. $5.

This annual publication opens with a brief review of the shipbuilding industry, which makes a rather poor showing. This is especially the case in regard to vessels for the foreign trade, not a single contract for such a vessel having been placed in this country during the past two years. Several contracts have been placed for large steamers in the coasting service; there are 41 warships under construction, and there is a fair outlook for the continuance of work on the Great Lakes.

Following this review come lists of officers of the various government bureaus connected with maritime interests, the U. S. lighthouse service, steamboat inspectors, and a list of the U. S Army engineers; also lists of members of the American and foreign associations of naval engineers and architects, and associations of vessel owners and managers, captains and pilots, etc. Yacht clubs and yacht owners and admiralty lawyers, are included. There are also directories of ship, engine and boiler builders in this and other countries, and directories of contractors for wreckage, dredging and public works on the Great Lakes.

There is a long list of dry docks and marine railways, with their dimensions, and 15 pages are devoted to a directory of steamship lines, while about 70 pages are occupied by an alphabetical list of steam and sailing vessels on the Great Lakes, with their dimensions and date of construction. Considerable space is devoted to the Lake Superior iron ore and its transportation. The lake ore carriers are described, also the great docks and terminals at lake ore ports, and there are records of the shipments. A long list of analyses of ore from the various mines is also given, and particulars are given of blast furnaces using the lake region ores.

Numerous statistics and notes of general information concerning lake commerce, the iron ore and coal traffic, grain traffic, freight rates, etc., are scattered through the book. The numerous illustrations consist mainly of half-tone engravings of vessels of all kinds; from a fishing smack to lake and river steamers, ocean and coasting liners, warships of various types, etc.; there are also views of some of the lake ports and iron mines.

THE ENGINEERING AND ELECTRIC TRACTION POCKET-BOOK.—By Philip Dawson, Assoc. M. Inst. C. E., M. Inst. M. E., M. Inst. E. E. Third Edition, Revised and Rewritten. London: "Engineering;" New York: John Wiley & Sons. Leather; 4 × 7 ins.; pp. 1,411; tables and figures in the text. $5.

The author states that this edition "has been completely revised, and a large number of sections have been entirely rewritten and brought up to date." He also says that a large amount of new matter on "heavy electric traction and power transmission" have been added to meet recent developments. After cutting out some matter this edition shows a net gain of about fifty pages of text.

TABLES AND OTHER DATA FOR ENGINEERS AND BUSINESS MEN.—Compiled by Chas E. Ferris, B. S., Professor of Mechanical Engineering, University of Tennessee. Knoxville, Tenn.: University Press. Leather; 3 × 6 ins.; pp. 152. 50 cts.

This is a combination of an abbreviated engineer's pocket-book, and of a plea, or pleas, for technical education, drawn from a great variety of sources. It is prefaced by a six-page announcement of the department of engineering, arts and chemistry of the University of Tennessee. The tables appear to be well selected and useful. On most of the pages the tables fall short of the full length of the page and the balance of the space is filled with quotations on technical education from college professors and others.

MAP OF PERU.—With a Short Description of the Country, etc., etc. Southampton, England: Eduardo Higginson, Consul of Peru. Large folder, in stiff paper covers.

The map named is backed by text. Those interested can obtain it on application.

YEAR BOOK OF THE UNITED STATES DEPARTMENT OF AGRICULTURE FOR 1902.—James Wilson, Secretary of Agriculture; Geo. Wm. Hill, Editor. Washington: Pub. Doc. Cloth; 6 × 9 ins.; pp. 912; tables, 11 plates, and 62 figures in the text.

Half a million copies is the regular edition of this annual publication, and of that number 470,000 are reserved for distribution by members of Congress. The Department itself has "only" 30,000 at its disposal, but this, the editor states, is far below the number of its regular correspondents. The statute under which the Year Book is printed requires that the volume shall contain a "general report of the operations of the Department, which this year covers 124 pages. The remainder of the book, according to the statute, is to be occupied with reports from department bureaus and divisions, and papers by special agents, all "suited to interest and instruct the farmers of the country." The 37 pages comprising the bulk of the present volume include a number on topics of no little direct interest to engineers and sanitarians, besides the many others that will appeal more particularly to the agriculturist, dairyman, stock breeder, and fruit grower. Thus, there are papers on the practicable limits of forest planting, on physical tests of timber, rainfall and irrigation, water analysis, algae in water supplies, and bacteria in relation to nitrogen available for plant food. Mr. C. G. Elliott contributes a paper on "Some Engineering Features of Drainage." In our issue of Aug. 27 we reprinted in somewhat condensed form, a paper by Mr. James W. Abbott on the "Use of Mineral Oil in Road Improvement." There is a large amount of statistical and other information in an appendix of more than a hundred pages.

THACHER BARS FOR CONCRETE STEEL CONSTRUCTION.—Concrete-Steel Engineering Co., Park Row Building, New York city. Paper; 6 × 9 ins.; pp. 16; illustrated.

This little pamphlet, issued by the firm named, is so certain to be useful to many engineers that we give it more prominent notice than we usually accord to publications issued by industrial concerns for advertising purposes. The pamphlet opens with a brief description of the Thacher patented bar for reinforcing concrete and some very pertinent general information respecting the choice and disposition of reinforcing members, the proper composition and consistency of concrete, water-proof concrete compositions, etc. General formulas for the strength of concrete-steel beams are then given, first, for rectangular sections with steel in tension only; second, for rectangular sections, with steel both in compression and tension, and, third, for T-sections, or sections composed of floor slab and joist. This discussion is followed by elaborate tables giving the safe loads per square foot and per lineal foot on concrete steel slabs of different spans and different thickness for both 1-2-4 and 1-3-6 mixtures, six months old, with a factor of safety of five. These tables also give weight of slab, size and spacing of bars, and quantities required of both concrete and steel. The pamphlet is to be had on application to the company named and should be secured by everyone interested in concrete-steel construction.

PROCEEDINGS OF THE WESTERN RAILWAY CLUB.—Published by the Club; Secretary, J. W. Taylor, 667 Rookery Building, Chicago. Cloth; 6 × 9 ins.; pp. 484; illustrated.

The Western Railway Club has for the past five years followed the commendable practice of binding up sets of its Proceedings each year, and distributing the volumes free to its members. This puts the papers and discussions in permanent form, avoids the trouble from missing numbers, and saves the members the cost of binding. A 10-page index facilitates the use of the volume for reference. The following is a list of the principal papers, many of which have been presented in abstract in our columns: "Locomotive and Car Scrap," T. A. Lawes; "One Cause of Leaky Tubes," S. W. Miller; "Review of the Master Car Builders' Convention of 1902," J. W. Taylor; "Damage Done to Freight Cars in Yards," J. H. McPartland; "Self-Cleaning Locomotive Front Ends," Frank Slater; "Machine Tools," J. K. Cullen; "Timber Preservation," Dr. Von Schrenck; "Average Lading of Freight Cars," J. H. McPartland; "The Railway Supply Car," J. P. Murphy; "A Modern Car Shop," W. E. Sharp; "The Chicago & Northwestern Ry. Co.'s Method of Purifying Water for Locomotive Boilers," by M. Davidson; "Paint," Houston Lowe; "Equated Tonnage Rates: Methods of Test and Calculation," Max H. Wickhorst; "Railway Repair Shop Design and Equipment," George A. Damon; "Injectors in Railway Practice," F. W. Edwards.

PASSENGER TRANSPORTATION SERVICE IN THE CITY OF NEW YORK.—A Report to the Merchants' Association of New York by Its Committee on Engineering and Sanitation. New York: The Merchants' Association. Paper; 6 × 10 ins.; pp. xxiv. + 216; many tables and folding sheets of diagrams.

The investigation here reported was instituted, the preface states, because the street and elevated railways of New York were disregarding public rights "to an extraordinary degree," through overcrowding and sanitary neglect of cars, refusal of transfers, and the abuse of the "car ahead" orders. The overcrowding was not confined to rush hours, but extended between, the report states, through taking off cars and trains between rush hours.

With the hope of remedying these evils the association called a public meeting and organized committees for investigation and action. There was a large legal committee, and a small committee on engineering and sanitation. This volume, with the exception of a general introduction by Mr. Wm. F. King, is composed wholly of the report of the latter committee, which was finally composed as follows, the first four being members and the last-named an associate member of the American Society of Civil Engineers: Samuel Whitney, chairman; H. Waller Brinckerhoff, Foster Cromwell, Chas. M. Myers, Geo. A. Soper.

The committee first gives 38 conclusions, and then presents in detail the data on which they are based. The conclusions recommend, among other things, more and longer cars, an experimental trial of double-deck cars, use of effective power brakes on some of the surface lines, several new surface car routes, more express trains and better station facilities on the elevated roads, and more regard for sanitation.

As a part of the investigation the committee caused to be made some detailed observations of the movements of surface cars and the obstructions thereto by other vehicles on certain streets. The results of these investigations are presented in the form of tables and diagrams, mostly in an appendix. Other appendixes include a report by Mr. John P. Fox on "Double Deck Cars in European Cities," the laws as to street obstructions and the use of streets, and a one-page table showing the passengers carried, not including transfers, on all the elevated and surface lines in the various boroughs of the city in March, April and May, 1902 and 1903, and the per cent. of increase of passengers and of transfers in 1903 as compared with 1902. The daily average number of passengers, not including transfers, is given as 2,770,000 for the whole city. Unfortunately the transfers are given for four months, and the passengers carried, not including transfers, for only three months, so no comparison between the two can be made.

THE WORLD'S COMMERCE AND AMERICAN INDUSTRIES.—Graphically Illustrated by 86 Charts. Prepared by John J. Macfarlane, Librarian. Philadelphia: The Philadelphia Commercial Museum. Paper; 6 × 9 ins.; pp. 112. 50 cts.

Diagrams are here used to show the relative values of the commerce of the various countries of the world, and the distribution of some of that commerce according to industries, countries and cities. The same information is also presented in tabular form.

USE OF MINERAL OIL IN ROAD IMPROVEMENT.—By James W. Abbott, Special Agent, Office of Public Road Inquiries. Reprint from Year-Book of the Department of Agriculture for 1902. Washington: Department of Agriculture. Paper; 6 × 9 ins.; pp. 15; three plates and four figures in the text.

This useful paper was reprinted in somewhat condensed form, but with the omission of all the illustrations, in Engineering News for Aug. 27, 1903.

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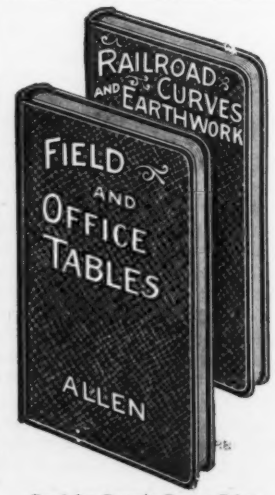

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Sec. 13.—EFFICIENCY, MAINTENANCE AND DEPRECIATION, AND COST OF POWER.
Appendix 1.—TRANSMISSION OF POWER.
Appendix 2.—CONVERSION TABLES FOR WEIGHTS AND MEASURES.

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THE MOTOR BOOK.—By J. F. Mecredy, Editor of "The Motor News." London and New York: John Lane. Cloth; 4 × 7 ins.; pp. 148; plates and figures in the text. $1 net.

This book is the second number in "The Country Handibooks" series which is being issued by the publishers named above, and its purpose is to give the amateur motor-car driver such information regarding the construction and operation of motors and driving and guiding mechanisms, and such directions for operating and caring for this machinery, as will enable him to avoid accidents and to locate and repair temporary disarrangements when they occur. The book opens with a description of the construction and operation of the internal combustion motor and its various parts. This description is free from technicalities and is clear and concise, so that no intelligent person should have any difficulty after its study in understanding all the ordinary intricacies of the gasoline motor as applied to automobiles. The second section on change gear and transmission is handled by the author in an exactly similar manner. There is a short section on the complete car, which explains the combination of the motor and driving mechanisms with the running gear and body to form the complete vehicle. A section on how to drive motor cars follows, and this is succeeded by a section on the care of the car and another on temporary derangements and their location and repair.

FURTHER CONTRIBUTIONS TO THE MANUFACTURE OF ARTIFICIAL SANDSTONE OR SAND-BRICK.—By S. V. Peppel, Special Assistant Ohio State Geological Survey. Printed in advance from "Transactions of the American Ceramic Society, 1903. Louisville, Ky.: The Author. Paper; 6×9 ins.; pp. 57; tables and illustrations. 50 Cts.

This paper was read at Boston, in February, 1903. The author states that it "is the result of work carried out to determine the allowable impurities in raw material and the conditions of manufacture which will produce the best sand-brick." He suggests

that the use of the term sand-brick be limited to those bodies which consist of a mass of sand particles bound together by a network of calcium, calcium-magnesium, or magnesium-silicate, formed by the action of steam under pressure upon silica or quartz and calcium or magnesium hydrates or a mixture of both of them.

The subject is discussed under the heads: Raw material and its preparation; behavior of the mixture in the press; hardening, testing, mechanical equipment, and merits of the various systems, including patents. The author sees no valid reason why plants should not be built and bricks made regardless of the patents described.

AMERICAN INSTITUTE OF ARCHITECTS.—Proceedings of the Annual Convention at Washington, D. C., Dec. 11 to 13, 1902. Glenn Brown, Editor. Washington, D. C.: The Institute. Paper; 7 × 10 ins.; pp. 263; 30 plates.

A valuable feature of this volume is the collection of addresses on the improvements proposed at Washington for the artistic development of the national capital along the lines of the original plans. All but one of the 30 plates illustrate the proposed improvements. There are also papers on the Massachusetts Metropolitan Park System, the "Architectural Development of London," and "The Evolution of Design," and "The Relation of the Architect and Engineer to the Design and Erection of Government Buildings." The last-named paper was by Major John S. Sewell, Corps of Engineers, U. S. A., and a few sentences from it may be quoted to illustrate the position taken by the author:

The writer's plan, without elaboration of details, is simply this: The engineer should be a government official, with authority to disburse funds and make contracts; the architect should be in private practice. The architect, selected in some proper way, should, in general, be responsible for the design of the building, and the government, through its own engineers, should erect it. If the government could develop a corps of salaried architects, with sufficient artistic ability, it would be manifest economy to do so; but the very nature of the case seems to make this impossible, and there is undoubtedly a very general sentiment that a "plan factory" is not conducive to the highest artistic excellence in building design.

State Control of Railway Companies.

The Interstate Commerce Commission has done a most useful work by issuing as a supplement to its 16th annual report a valuable monograph on State Regulation of Railways, prepared by Prof. Henry C. Adams, who has been Statistician to the Commission since its establishment. The Commission has issued to the press an advance summary of the contents of the book, from which we glean the following facts:

Railway commissions now exist in 30 different states of the Union. The tendency toward increased adoption of state control is proved by the fact that six states which had no railway commissions in 1890 have since established them. It is true that in the same period four states abolished their railway commissions; but two of these subsequently re-established them, and in the other two cases the step was taken in response to public demand for more stringent control over railway corporations than the commission had practiced.

There is also a tendency to increase the authority of the railway commission. Prof. Adams classifies the commissions as "strong," or "weak," and he finds that while in 1890 there were 15 "strong" and 13 "weak" commissions, in 1902 he finds 20 "strong" commissions and 10 "weak" ones. In general, therefore, the tendency during the past 12 years, so far as legislation is concerned, is toward more efficient control over railway rates.

Not only is the tendency evident toward increasing the power of the commissions over railways, but many states are giving these commissions authority to control other corporations engaged in public service. Thus we learn that in 1902 eight state railway commissions exercised control over street railways as well; 4 over steamboat companies, 13 over express companies, 8 over telegraph companies, 2 over telephone companies, 5 over transportation companies, fast-freight companies, etc., 5 over railroad-bridge companies, 1 over railroad-tunnel companies, 3 over railroad-ferry companies, 5 over warehouses, 3 over union-depot companies, 6 over car companies, 7 over sleeping-car companies, 1 over harbor companies, and 1 over all railroads operated by steam or otherwise, including tramways. There were in all, in 1902, 72 cases of control by state railway commissions over agencies of transportation other than railways, as against 41 in 1890.

A change (and in our opinion an undesirable one) has taken place in the method of selecting railroad commissioners. In 1890 the prevalent method of selection was appointment by the Governor. In 1902 popular election seems to have the preference. In 1890, 18 commissioners were appointed by the Governors of the states, as against 13 in 1902; 6 were elected by the people in 1890, as against 15 in 1902.

The office of Railroad Commissioner is not usually a highly lucrative one. The salaries range from $1,200 in North Dakota to $8,000 in New York, while $3,000 is perhaps a fair average.

An illustration of the tendency toward putting increased power in the hands of the commissions is authority to make a general schedule of freight and passenger rates. Only seven commissions had this power in 1890, but thirteen had it in 1902.

In a few states some popular distrust is evident of the ability of the railroad commissions as at present organized to effectively control the railway situation. The most notable example of this is in Kansas, which abolished its railway commission and in 1898 established a "Court of Visitation." The law establishing this "court" aimed to combine administrative and judicial functions deemed necessary for the satisfactory control of railway operation. In 1900 it was declared void on the ground that in it the "legislative, judicial, and administrative powers are so inextricably interwoven as to render their separation impossible."

As many of our readers will recall, taxation of

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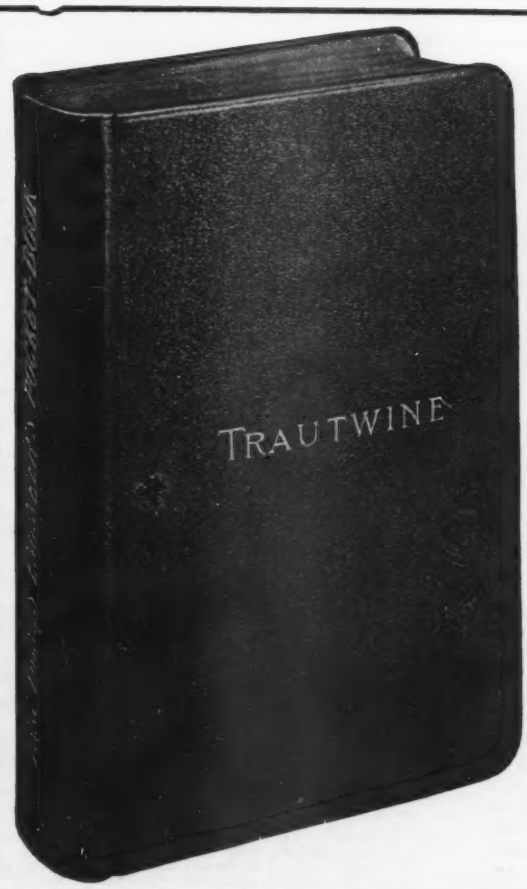

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railway corporations has been a fruitful subject for discussion in many states during the past few years. Part V. of Prof. Adams' report is devoted to the State Taxation of Railways. He notes that the total taxes paid by railways now amount to more than $50,000,000 per annum. Twelve years ago, there appeared to be a tendency to substitute a tax on earnings for one based on property valuation. There has been no advance in this direction, however, and the changes of the past dozen years have been principally in methods of assessing, levying and collecting taxes based on the value of the property owned by railways.

RAILWAY MAP OF ILLINOIS.—An excellent railway map of the State of Illinois, made on a scale of eight miles to the inch, has just been issued by the State Board of Railroad and Warehouse Commissioners. The map as sent to us is backed with canvas and mounted on a spring roller secured to a hardwood frame for placing against the wall. The lines of the different railway companies are represented by distinctive colors, and small figures show the distances between stations to the nearest quarter mile. Figures also show the population of cities and villages of more than 100 inhabitants. Illinois has over 11,300 miles of railway in operation or about one mile for each five square miles of its territory. An inspection of the map shows that a very small part of the state's area is located at a greater distance from a railway line than eight miles.

Literary Magazines.

"The Cotton Crop of To-day" is the subject of a paper by Mr. R. H. Edmonds in the September "Review of Reviews," in which he shows that the cotton plant and its products furnish a larger amount of value for export than any other single crop which we raise. He notes that the successful mechanical cotton picker is yet to be produced and if invented would be worth many millions of dollars to Southern planters; also that the boll-weevill is a source of danger to the crop of the future. No remedy has yet been found for this pest and the state of Texas has offered a $50,000 reward for the discovery of an effective remedy. Concerning the growth of cotton manufacture in the South, it may be noted that whereas in 1890 only 546,000 bales of cotton were used in Southern mills against 1,800,000 bales in Northern mills, in 1902 the Southern mills consumed nearly as much cotton as the Northern mills, in round numbers about 2,000,000 bales in each. In the same magazine there is described a curious type of traction engine which has been in use in the woods of northern Michigan by the Alger Lumber Co. to haul sleds over the snow. The traction is secured by a toothed cylinder of boiler iron. The whole machine weighs about 25 tons and is capable of hauling a train of log sleds carrying a load of 30 to 60 tons over snow 2 to 3 ft. deep. The machine is the invention of Mr. Geo. T. Glover, of Chicago. Still another article in the same magazine discusses the recent renomination of President Diaz of Mexico and the political conditions which have developed in that country.

In the "Nineteenth Century" for August Mr. Robert Machray describes "The Granary of the Empire" and discusses the prospect that the wheat fields of the Canadian Northwest will in time be able to supply the demands of the British Islands for breadstuffs. In Manitoba last year some 38,000 farmers raised 53,000,000 bushels of wheat and only 3,000,000 acres were under cultivation out of a total arable area of 23,000,000 acres. Add to Manitoba the enormous area of fertile land in the Northwest Territories and the possibilities of Canadian wheat production become apparent.

In the September "North American Review" we find an interesting statement of "Why the Panama Route Was Originally Chosen," written by M. Crisanto Medina, of Guatemala, who was the delegate from that country to the International Congress held in Paris May 15 to 25, 1879. This Congress was presided over by De Lesseps and was made up of 62 foreign delegates and over 80 French engineers. All the latter were appointed by de Lesseps; and when the matter of choice of routes was brought to a vote, all these French engineers voted in favor of the route for which De Lesseps already held the concession. M. Medina states that at one time in the Congress every foreign delegate without exception favored the Nicaragua route. It may be added by way of comment that at the time that Congress was held not a thousandth part of the information concerning the different routes was in existence that has since been obtained. Mr. A. S. Hurd in the same magazine writes of British Naval Progress, explaining that quality and not quantity is now the watchword of the British navy and that thorough drill in gunnery and in all the evolutions of warfare is now diligently carried on. Thus the superiority of the British force in the future is to depend not on mere number and size of vessels and weight of armament, but on excellence of personnel.

An article of surpassing interest in "The Century" for September describes the wonderful transformation which has taken place in Mount Pelee. An enormous spine or shaft of solid rock has been forced up out of the top of the mountain like a large plug and its top now projects over a thousand feet above the summit of the mountain. It is several hundred feet in thickness and its sides are vertical in places. It has been apparently forced up bodily from below by the enormous pressure beneath. This feature is something never before observed in the studies of volcanoes. In "The Century" also is described the first ascent of Mount Assiniboine, a peak 11,860 ft. above sea level, located 20 miles from Banff, on the Canadian Pacific Ry. The ascent was made on Sept. 3, 1902, by James Outram in company with two Swiss mountaineers, C. Hasler and C. Bohren. Still another "Century" paper worthy of note is one by Hon. W. R. Merriam, recounting some of the notable facts revealed by the last census.

The effect of low temperature on organic life is the subject of a paper in this month's "Harper," in which are described experiments on bacteria subjected to the temperature of liquid air and later to liquid hydrogen. The particular species of bacteria selected survived this temperature for six months and their vitality appeared to be unimpaired afterward. In connection with this it has been found that the typhoid bacillus, for example, becomes so brittle at the temperature of liquid air that it can be ground to powder, and in this way the cell juices of the typhoid organism have been obtained and devitalized toxins have been prepared. In connection with this discovery the author suggests the curious theory that life might have been started upon the earth by an organic cell falling from space in cosmic dust. He fails to state, however, where such a cell might be expected to come from or what would start it on its journey.

PROFESSIONAL PAPERS OF THE U. S. GEOLOGICAL SURVEY.—Chas. D. Walcott, Director, Washington, D. C.: Pub. Docs. Paper; 9 × 11½ ins.

No. 1: Preliminary Report on the Ketchikan Mining District, Alaska, With an Introductory Sketch of the Geology of Southeastern Alaska. By Alfred Hulse Brooks; pp. 120; 6 figures and 2 plates.

No. 2: A Reconnoissance of the Northwestern Portion of Seward Peninsula, Alaska. By Arthur J. Collier; pp. 70; 12 plates, including a large topographic map, map.

No. 3: The Geology and Petrography of Crater Lake, National Park. By Joseph Siles Diller and Horace Bushnell Patton; pp. 167; 19 plates.

No. 4. The Forests of Oregon. By Henry Gannett; pp. 36; 7 plates, including a large forestry map of the State of Oregon.

No. 5. The Forests of Washington. A Revision of Estimates. By Henry Gannett; pp. 38; 1 large land-classification map of Washington.

No. 6: Forest Conditions in the Cascade Range, Washington, Between the Washington and Mount Rainier Forest Reserves. By Fred. G. Plummer; pp. 42; 11 plates, including a topographic map showing land classification.

No. 7: Forest Conditions in the Olympic Forest Reserve, Washington. By Arthur Dodwell and Theodore F. Rixon; pp. 110; 20 plates, including a topographic map showing land classification.

No. 8. Forest Conditions in the Northern Sierra Nevada, California. By John B. Leiberg; pp. 194; 12 plates and maps, showing land classification.

No. 9: Forest Conditions in the Cascade Range Forest Reserve, Oregon. By H. D. Langille, Fred. G. Plummer, Arthur Dodwell, Theodore F. Rixon and John B. Leiberg, with an introduction by Henry Gannett; pp. 298; 41 plates, including 3 large land-classification maps.

No. 10: Reconnoissance from Fort Hamlin to Kotzebue Sound, Alaska. By Way of Dall, Kanuti, Allen, and Kowak Rivers. By Walter C. Mendenhall; pp. 65; 9 plates, including outline map of Alaska and three reconnoissance maps.

No. 14: Chemical Analyses of Igneous Rocks. With a Critical Discussion of the Character and Use of Analyses. By Henry Stephens Washington; pp. 495.

The contents of these papers, so far as they interest the readers of this Supplement, is sufficiently indicated by their titles.

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